# The Science Teacher

Including

THE ILLINOIS CHEMISTRY TEACHER

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## The First Course in Chemistry


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The writer hesitates to add his opinions to all that has been spoken and written on the subject of the contents and the methods of teaching the first course in chemistry. After many trials, he is still undecided as to the best procedure to follow in presenting the course to beginning students. He has listened to speeches on project plans, lecture-demonstrations versus individual student-experiments, combined courses in chemistry and physics, survey courses in physical science to replace the courses now taught, the need for generalization instead of specialization, the feebleness of the college course (sometimes said to be no more than the high school course), the uselessness of the high school course and its too close resemblance to the college course, the overlapping of the two courses for students who study the subject both in high school and in college, pandemic chemistry, the ignorance of college teachers in matters of professional teaching methods, the lack of proper preparation in chemistry on the part of the high school teachers, and many, many more. All of this must mean that there is probably some ground for the belief that the first course in chemistry can be profitably studied toward the end that more generally successful teaching methods and a better selection of subject matter ultimately are attained.

Many of the suggestions that have been made for the betterment of the course have been tried out in the writer's classes; other suggestions have been observed at work in the classes of other instructors; still others have been disregarded as unworthy of serious consideration. Out of these experiences have come certain opinions, none of which are especially new, concerning the character and extent of the first course and the methods of teaching that are most effective.

(1) The objectives of the course should be three in number. First, we should aim to acquaint the student with the laws, principles, and theories upon which the science is based. The number of these that should be included must be determined by the time available, the needs of the particular groups of students in our classes, and their ability to understand the evidence upon which the principles and theories are based. In short, we must first try to acquaint the student with the most important portions of the foundations of chemistry and lead him to see how the science has grown into what it is today. Secondly, we must make the scientific knowledge of the present century, with all the advances in thought that go with it, an integrated part of the story of chemistry's development. The student should be made aware that the development of the science is not complete, that it is still growing, and that a great deal remains to be done. The more material along these lines that we introduce into our course, the more understandingly the boys and girls in our classes today can read the newspapers and books of tomorrow. Thirdly, we must teach the applications of chemical principles to problems of everyday life,

to industry, to agriculture, and to the many other phases of man's activities. We must also show how chemistry explains many natural changes, such as the weathering of rocks, decay, the fertility of the soil, the rusting of metals, the uses of fuels, the digestion of foods, and many others. All this is important to show the role that chemistry plays in helping man to understand his environment and to provide adequately for his needs and comforts. But to teach these applications of chemistry, we must first teach the principles upon which explanations of the applications are based; hence, we must emphasize the first objective of the course. The writer is old fashioned enough to believe that the first function of education is to lead those who go through the process to greater knowledge, knowledge of themselves, of society, of organized activities, and of all the biological and physical portions of the universe. By this added understanding, and to the extent that it is enhanced, the individual develops a fuller appreciation of his own place in the universe and the place of every other thing. We who teach chemistry have an important part in this educating process because of the extensive character of the subject matter that we teach. We should be sure, at all times, that the knowledge that we try to impart consists of something more than isolated facts or generalizations that leave the student wondering why they are thought to be true or whether or not they are really true at all. Useful knowledge is not of that type. Surely every teacher of chemistry, early in his career, comes to the conclusion that it is unwise to ask his students to believe any statement of chemical laws or theories unless he has provided them with some reason for belief.

(2) The content of the first course in college and in the high school should differ in extent rather than in character. Both must be specialized, if by specialization we mean that they must deal with knowledge of substances and the changes that they undergo. The one deciding factor upon which we must rely in deciding how far to go and how much subject matter we shall present is the understanding of the students in our classes. No more chemistry should be presented in the course than it is possible to supply with an adequate basis and background of facts and principles. I have heard of educational leaders who claimed, for example, that to understand atoms and molecules the student does not need to know anything concerning the atomic theory or the evidence upon which it is based. We can start off, they say, by telling the student that chemists are agreed that matter must consist of such particles. There is serious doubt, in the writer's mind, that any useful information concerning atoms and molecules can be acquired by the student without some knowledge of the physical and chemical facts that support our belief in their existence. To be of much meaning, the atom must appear real to the student; unless it does it can become only another word to add to a meaningless and soon discarded vocabulary. We should not stress, they tell us, strict definitions of terms and phrases peculiar to the science of chemistry. This assumes that we should teach simple kinds of chemical change without explaining them or perhaps explaining them without increasing the student's vocabulary. To acquire an understanding of the simple changes related even to combustion and oxidation, the student must have some knowledge of facts and principles that are likely to be tagged as "things too technical for the average boy or girl." He must know something about elements, pure substances, air, oxygen, oxidation and reduction, atoms and molecules, the Law of the Conservation of Mass, the Law of Definite Proportions, etc. Our teaching of combustion cannot be complete until these subjects have been covered. The writer cannot agree with the opinion that there can be and should be a great difference between the types of subject matter of the high school and the college courses. The first objective of each must be to provide the student with a knowledge of substances and the general principles that govern their behavior. So far as it goes, this knowledge must be complete, not a random collection of information, but a well rounded and in-

tegrated story, all parts of which lead in the same direction. In the college course, it should be possible to go considerably farther and to give the student a knowledge of more substances and their changes. But in neither case, should our attempts to teach carry the student farther than it is possible to build upon a clear basis of facts and understanding.

(3) There has been a great "hue and cry" that teachers of elementary chemistry try to make specialists of their students. The writer has never found a specialist among the boys and girls who have entered his college course from the high school; hence, if the charge against high school teachers is justified, they fail even here. He is most certain that no specialist in chemistry has ever left his course. On the other hand, he hopes that a few, at least, have left the course with a better understanding of the chemical nature of the world they live in and of the part that chemistry plays in their lives. If this objective be specialized, what pray tell us, is the generalized aim of the teacher to be? The only specialist that the writer has observed among teachers of chemistry is the "specialist in generalization,"—generalization in unsupported conclusions, generalization in isolated facts, generalization in random information, and specialization in pseudo knowledge and in the false belief that one is educated if he has a few encyclopedic statements in his memory and the faint recollection that somewhere, sometime he has heard or has read about others. Beware of this specialist. He would remove from our teaching all worthwhile generalizations.

(4) Effective teaching is not all telling, or reading, or experimentation. We need all three. Laboratory work provides the opportunity of learning something by first-hand observation. However poorly designed the experiment, few students ever perform it without doing a little thinking concerning what they are doing and what the results mean. Certain critics sometimes complain that students in the chemistry laboratory do not know what results to expect from an experiment. In the opinion of the writer, it is perhaps better that they should not have been told all that may happen when an experiment is done. At least, there should be some element of uncertainty, an "unknown" to solve. In the laboratory, the student learns to observe and to interpret what he observes. We should not find fault with him, or with his instructor, if the results, especially at first, are not all that we would like to find.

The textbook serves the important purpose of providing a definite outline and organization of the course, leading the student toward the correct generalizations and providing a check upon the conclusions that he may arrive at entirely upon the basis of his own reasoning and opinions. The lecture (and the writer has great faith in its effectiveness) extends and reviews the outline that has been first provided in the textbook. By means of short lectures now and then, the instructor places emphasis where it belongs and can, if he is skillful, open up new fields of thought in the minds of his students. The recitation helps the student by testing his understanding and grasp of the organization and the conclusions. Both recitation and lecture may be used to show the proper relations of the experiments performed in the laboratory to the different parts of the course's outline. To most satisfactorily serve this purpose and fit in with this plan, the experiments should involve general principles rather than isolated facts concerning the properties of different substances. Each experiment, if possible, should be completed in a single period and should immediately precede the study of the same principle or principles in the class room. As many of the experiments as possible should be centered about an "unknown", which may be an atomic weight, a molecular weight, a formula, the composition of some sample of material, a density, a boiling point, freezing point, etc.

(5) In keeping with the objective already stated, it appears that the first course in chemistry might, with profit to the student, deal with organic chemistry, biological chemistry, and industrial chemistry more extensively than is the usual practice. Our critics are probably

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# THE SCIENCE TEACHER

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## CHEMISTRY LUNCHEON

Every member of the Illinois Chemistry Teachers Association should note the luncheon as given on program.

## SOCIAL HYGIENE EDUCATION THROUGH SCIENCE COURSE

In bringing social hygiene to the stage of public discussion and of public instruction in the schools we are attaining a real land mark in public welfare. Our past policy of silence and of keeping the public in general ignorance of social diseases has led to much avoidable suffering. Fortunately, that policy is definitely abandoned. For the present impetus given to social hygiene education in the schols of Illinois much credit is justly deserved by Mr. P. K. Houdek, of the Division of Child Hygiene of the State Department of Public Health in Illinois, who has had considerable success in handling the matter in high school biology classes as well as arousing public interest over the State.

Holding the Conference on Social Hygiene Education in conjunction with the Illinois High School Conference at Urbana, November 5 and 6, provides the opportunity for learning of its possibilities, both for the school administrators who may want to introduce the work into their school systems and for the science teachers who will handle the work in their classes. A passing interest and morbid curiosity to visit the conference is not enough. It is to be hoped that the administrators and the teachers who attend will have the courage to get behind the movement and give this much needed education to the students in their schools.

## SCIENCE PROGRAMS

The science programs offered this year at the Illinois High School Conference especially show careful planning to meet the needs of teachers and also offer outstanding speakers of which several are national figures. Now that curriculum revision in Illinois is under consideration it is particularly desirable that objectives in teaching and types of courses be given consideration along with teaching methods. Science teachers will also appreciate the fact that a part of each program is designed to keep them abreast of what is being done in industry and what is new in the field.

## EVOLUTION OF SCIENCE TEXTS

The modern Rip Van Winkle awakening in science to the cataclysm of change may well be startled by the innovations in texts that we today view as a matter of course, but which may appear radical in terms of the latest models of twenty years ago (or even ten years ago). Then college texts provided the pattern for the high school text book writers. In fact, science texts then published for the high school may be aptly described as college texts written down (at least partly) to the level of the high school age. Science was held up more as an orderly arrangement of facts and principles to be mastered as a part of an education rather than something that intimately touches and applies even to the most common and ordinary things of life. College preparation was a major objective and often the only one, one that leaders in science education of today would consider of secondary importance, since a large portion of the high school group of students terminate their education in the high school. Of those that do go ahead to college, only a small percent specialize in science. Consequently, college preparation is no longer an important part of high school science teaching, and texts written for a college preparatory course are losing favor, especially with the progressive teacher who tries to fit his course to the present needs of his students.

The average high school student of today is different from the one of twenty years ago because now a much larger portion of the young people continue their education in the high school, not altogether because they desire a more thorough training but partly because it is the popular course to follow and partly because there is nothing else for them to do. They desire subject matter that is clearly related to their life. If a science course does not provide it, they avoid the course if possible. Physical science courses particularly have suffered because the teacher was not willing to meet the needs of the students in science or could not provide a text that would serve to enrich the course. It has been quite disturbing to see students elect social sciences and the more modern practical subjects when science is working rapid changes all about us, revolutionizing, and becoming the dominant force of the environment. Leaders in science education and publishers have gradually awakened as did Leigh Hunt's

> Abou Ben Adhem may his tribe increase
> Awoke one night from a sweet dream of peace
> And saw . . .

The light they saw has been most illuminating and has been constantly giving us better courses with more satisfying objectives and also better texts that more nearly meet our present needs. And the end is not yet.

New life came into high school science when general science—in the past so much despised by the science teacher as a conglomeration—came into the field to open up science as related to the student's life and to give him a glimpse as to where science led. General science grew rapidly in favor because it offered something of real value to all students. Then botany and zoology in many schools were merged into biology and at the same time given a "life saving" turn toward a functional science that related itself to the facts and principles of the living, rather than stressing so much the anatomy of the dead. It was certainly a magic touch that worked this transformation, if we may judge by the recent growth of popularity of this subject. And so once again the educators and publishers rang the bell as the objectives of the course became those of recognized value in life and as satisfactory texts were provided to meet the needs of the course.

The physical sciences have been somewhat slow to respond to changed conditions, chemistry even more than physics. However, within recent years the change in the courses has been marked. Publishers have sensed the trend and are bringing out texts in each subject, especially chemistry, that are more serviceable in attaining the objectives now recognized of live value.

**John C. Chiddix.**

# Photography as an Extra Curricular Subject

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The chemical changes which the salts of silver undergo when exposed to light, are the basis of the art of photography, not because these are the only salts which are affected by light, but because none of the others are so advantageous, on the whole. The understanding and control of these reactions are such that it requires more time to master them than is ordinarily available in a chemistry class. Since Photography is fast becoming an avocation of many people in this day of more leisure time, it seems necessary to help those of our future citizens who are very much interested in photography to acquire a knowledge and skill in its practice, so that they may use it as an educational pleasure in their future.

This can be done in three ways (1) in class, (2) a class after school, and (3) in clubs. It is the second one of these that I have been using and that I will tell you something about. It is exactly what its name implies, an extra curricular subject, a class after school carried on as any other class would be except for the time of meeting, and I might say its personnel has the advantage of having only members who are very interested in the work at hand.

We meet once a week throughout the semester during which time we discuss photography fom the standpoints of its history, chemistry, physics, manipulation, lighting and composition. The subject is, however, limited to the field of still photography, because of our lack of equipment for demonstration of moving picture photography.

The first meeting is taken up with a historical review of the subject from the making of silhouettes on silver nitrate paper by Wedgwood in 1880 and the fortunate mistake of Daguerre in 1839, stressing the points of human interest. Fom this introduction the study of the subject is continued, helped and guided by an outline furnished by the Eastmen Kodak Co., "An Elementary Course in Photography." This guide, which may be had for the asking by any teacher, contains an outline for thirty lessons, many of which are optional. For the teacher who has had very little experience with a camera it is a great help, and for the teacher who has an extensive background it offers little sidelights that are very helpful.

### 1. History

Since this phase is factual I believe nothing more than has just been said will be necessary at this time.

### 2. Chemistry

The chemistry of the silver halides is explained thoroughly as far as it is connected with photography. This portion of its chemistry includes the reducing action of light, the relative sensitivity of the different halides, the agencies that govern development, grain size, the action of a developer on light exposed emulsions, the solubility of the silver halides in different solvents, and the bleaching effect of various agents on coloidal silver.

All of this would take a great deal of time if it were to be fully mastered, but it must be remembered that a knowledge of chemistry is not necessary for the taking and developing of good pictures. Therefore only a few periods are spent on this phase of photography. This is enough to interest the student in finding out more and drawing his own conclusions from what he has read and observed in practice as to how chemistry can help him obtain better results.

### 3. Physics

For the beginner the knowledge of the physics of photography is the most important factor for him to consider in making good pictures. To give him a good start in this field each group of two or three students makes a pinhole camera.

After he thoroughly understands the principles involved in this piece of apparatus he experiments with simple convex lenses and compares the camera with the eye. The complete camera with its lens diaphragm, shutter, and ground

glass is next studied in relation to the quantity of lights delivered to the focal plain by the changing of the lens aperature and the shutter speed.

**4. Exposing**

To learn the relation between photography and the information already gained the entire group is now taken out with their home made and ready made cameras, for practice in taking pictures of all kinds of subjects under many different conditions. Different students are asked their opinions as to the time and aperature necessary for each picture. They are to record this data and check the results after the film is developed, thus making it possible to eliminate future mistakes in exposing the film.

**5. Developing**

Developing is first demonstrated and later practiced, but even this is insufficient for the amateur who expects to do very much of his own work. It is also necessary for him to know actually what goes on in the different solutions. With this knowledge he will be better able to solve his own problems.

Since the effect of the light on the silver compound in the film is so slight it is necessary to increase the differences of density by development. Only a few chemicals have the power of distinguishing between exposed and unexposed grains of silver bromide. Of these the most important are pyrogallol, hydroquinine, and elon.

However a solution of one of these is not all that is necessary to develop a film, in fact nothing would happen if an exposed film were put into such a solution. The stumbling block is that these reagents must be used in the presence of an alkali such as sodium carbonate. Even this solution has its drawbacks, since it will keep only a short time. To preserve it, sodium sulfite is added, and in order to regulate it potassium bromide is needed.

After the uses of the various reagents have been determined and the relative strength and efficiency of the different developing agents are compared, the effect of changing the proportions of the contents of the developing solution is discussed.

**6. Printing**

Printing is a process of reversing the negative image and placing it on some material that makes a serviceable backing. This backing may be glass, paper, cloth wood, celluloid or any number of other substances.

This process is very similiar in nature to that of exposing and developing the negative. Although two wrongs never make a right, two negatives do make a positive therefore this is little more than making a negative of a negative To do this with ease and skill a little practice is necessary, which the class gets during several of the later lessons.

The only new step we have to encounter in this process is toning. This is discussed and demonstrated but not practiced due to the little demand that the amateur will ever find for it.

**7. Reduction, Itensification & Reversal**

Reduction and intensification are seldom needed, and reversal is hardly ever used by the average photographer, but I can remember an overexposed film that offered me a great deal of delight by substantiating an excellent fish story after the negative had been reduced enough to make possible an acceptable print.

Both reduction and intensification are demonstrated and practiced while the reversal of negatives and prints are only demonstrated so as to give a better understanding of movie technique.

**8. Enlarging**

Enlarging is simply a process of making a print which is larger than the negative. Modern equipment makes this operation as simple as contact printing and enlargements from some of the new small negatives are often superior to contact prints from larger negatives.

A demonstration and practice with the simplest form of enlarging camera which consists of a light tight box holding a negative at one end, the sensitive paper at the other with a lens at the proper distance between is sufficient to let the novice in on the secrets of enlarging and dispel his fears as to the difficulty of the process. During the demonstration, the need of a different

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# The Use of Bacteria in Warfare

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Sensational sections of newspapers frequently serve the public with accounts of how bacteria will be used in the next war to accomplish in destruction of human life that which has never been accomplished before. A war is scarcely finished before one hears of new weapons and tactics for prosecution of the next. Suggestions that pathogemi bacteria will be used in the next war are not new. As soon as the United States declared war on Germany in 1916 rumor was abroad that German agents were spreading tetanus germs and that court plaster was an effective means for this purpose. Bacteriological examination of specimens of court plaster revealed the presence of these organisms but no evidence could be secured to indicate that they were placed there maliciously nor that they might not be present during times of peace.

Accounts have appeared now and then indicating that bacteria may have been used for doing away with individuals deemed to be undesirable or whose death would bring desirable ends for certain individuals. One such instance occurred in India where the victim was supposed to have been given an injection of pathogemi bacteria as he waited before a crowded ticket window at a railway station. The suspected individuals, at first sentenced to death, were given sentences of transportation for life. The press in Chicago a few years ago reported evidence offered in a murder trial in which living typhoid bacteria were said to have been administered to the patient. The evidence did not warrant a verdict to this end and the accused was freed.

The methods of mortal combat have undergone progressive development. Primitive man, probably, had no weapon other than his hands when he decided to fight his neighbors. He depended on brute strength and perhaps his teeth. Later he may have carried a rock with which to brain his opponent. Later this rock was tied to a stick, sharpened, and used as a hammer or ax. These methods made it necessary for him to contact his enemy which subjected him to considerable danger. He then put the rock in a sling or other implement which permitted him to propel it from a distance. So also with the club. This was made smaller, sharpened, and shot from a bow. Man's efforts have been made to avoid close contact. The Germans shelled Paris from a distance of 25 miles. Aeroplanes are now dropping bombs from great distances. Use of bacteria would permit him to accomplish somewhat the same results.

The problem of using bacteria in warfare comes to the question as to whether it is possible to start epidemics artificially. While it would be possible probably to do so during times of peace, it would be difficult during times of war. The ideal bacterium for this purpose does not exist. Man has developed methods for fighting those which cause the great epidemic diseases during times of peace and it is reasonable to believe that he would use the same methods during times of war.

Bacteria causing the so-called intestinal diseases such as typhoid fever, dysentery and cholera, are among those which are thought of first as threats in bacterial warfare. Discussion of almost any one of them would suffice for the other members of the group. Let us take Eberthella Typhosa, and the disease which it causes, typhoid fever, as an example. It is an epidemic disease which is caused by infected foods, water and milk, and by carriers. It is a communicable disease of such proportions that civilized countries must keep an active defense against it at all times. It is always present and were we to relax our measures to prevent it, it would flare up. Only by constant, efficient efforts such as sterilization of water, pasteurization of milk,disposal of excreta, quarantine and others, is man able to keep typhoid fever under some sort of control.

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# DRY ICE

EDWARD ZETTERBERG

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Thilorier first made solid carbon dioxide in 1835. The year 1925 saw the first commercial solid $CO_2$ placed on the market. With the growing popularity of this product the name "Dry Ice" was applied. This is a rather appropriate name, since the solid somewhat resembles water ice in appearance, is cold, and sublimes instead of forming a liquid.

The temperature of Dry Ice is -78.9 degrees C., and one pound will absorb 275 B.t.u. in changing from a solid to a gas at 0 degrees C. Water ice absorbs 144 B.t.u. in changing from the solid at 0 degrees C. to liquid water at 0 degrees C.

There are many commercial sources of carbon dioxide but only the chief method of producing it will be described here. This process burns coke to produce the $CO_2$ and utilizes the heat of combustion to make steam, which is used as a source of power and of heat in the process. The accompanying diagram depicts this process and will be briefly explained.

When a fire is first started in the boiler, the gases are passed out the stack as waste material. When the fire bed is just right, the valve to the stack closes and the blower draws the hot combustion gases through two water scrubbers connected in series. These scrubbers are about eight feet in diameter and 20 feet tall and are filled with lumps of limestone. This filling material causes a better washing of the gas with cooling water and the limestone also re-acts with the acid impurities such as $SO_2$. The blower then puts the gas under pressure and forces it through the two absorption towers which are in series. These absorption towers are

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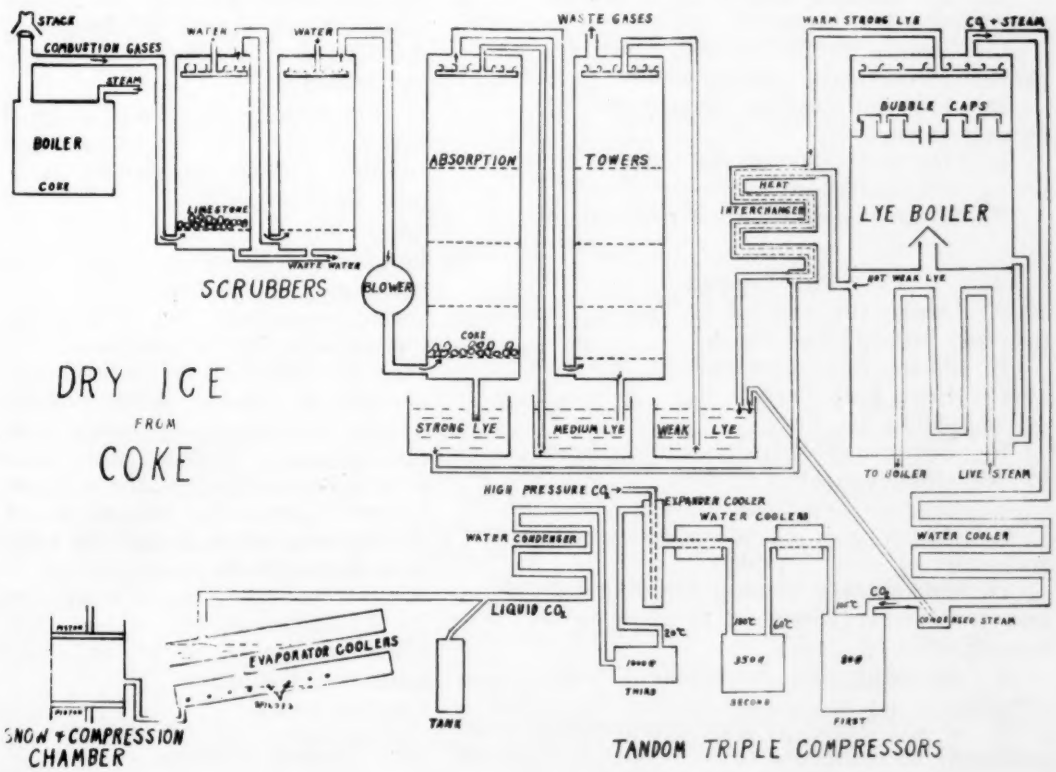

# The Essence of First Aid

JOSEPH H. BEARD

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## I. General

A. Definition: First aid is the immediate temporary treatment given the ill or injured before the services of a physician can be secured.

B. The duty of the first aider ends where that of the physician begins.

C. There is no conflict between first aid and medicine.

## II. Purposes

A. To prevent accidents.

B. To take immediate, intelligent action to save life, reduce suffering, and avoid complications which may result from delay, lack of knowledge in giving help, or improper handling.

C. To do the right thing in the correct way at the proper time.

D. To do good but in doing good not to do more harm than good.

## III. The First Aider

A. Keep cool.

B. Do nothing unless it is known why and how it is to be done.

C. Refuse to be hurried, but act promptly, correctly, and precisely.

D. Do not become dangerous by getting rattled.

E. Do not frighten the injured by losing self-control.

F. Make the crowd give the patient air.

## IV. The Injured

A. Make the injured lie down. It prevents fainting and shock.

B. Make him comfortable.

C. Keep him warm.

D. Allay his fears.

E. Prevent choking by turning head to side when vomiting occurs.

F. Give no drug; use no antiseptic.

G. Never give an unconscious person water or other liquids.

H. Do not try to stop bleeding unless it is severe; then use pressure or a tourniquet.

I. If poison has been taken, cause vomiting.

J. If suffocated by gas, remove immediately to open air.

K. If needed, start artificial respiration at once.

## V. The Physician

A. Call a doctor, but only one.

B. Be sure he will come at once.

C. Tell him exactly where the patient may be found.

D. Inform the physician of the nature, course, and probable extent of the patient's injury.

E. Tell him as to what first aid has been given.

F. The doctor should be told what supplies are available at the scene of the accident.

G. Let the physician order an ambulance if necessary.

## BURNS

### I. Fire

A. Prevention.

B. Rescue.

1. Wet handkerchief over the mouth and nose may lessen the danger of inhaling a flame but it is not a gas mask.
2. If the clothing is on fire, compel the individual to lie down and smother the fire with coats, rugs, or a blanket.

C. Treatment.

1. Do not use dressings which may carry germs into burns.
2. Avoid procedures which may interfere with future treatment.
3. Dissolve the contents of the bottle containing **Tannic Acid Powder** in the accompanying bottle containing water. Shake well, then pour the solution into the sprayer. Spray it over the burned areas, taking **care not to permit the solution to touch the yes.**
4. Cover the burned areas with sterile GAUZE from the cabinet. Saturate the gauze with the above **tannic acid solution.**
5. Combat shock.
6. Call a doctor.

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# Practical Science Projects

***For teaching science principles, creating intense interest, solving those problem cases and providing club activity***

**SEARCH NO FURTHER** through text books, recipe books and plans for doing things that may not even work.

The projects listed are the outgrowth of successful project work by science students, and are selected because of their value in teaching and their popularity with students.

**WORRY NO MORE** about information for carrying out a project. Complete information for carrying out the projects is given, together with some discussion of the application and value.

The following projects are taken from teachers' work sheets and are published in mimeograph form in groups of five.

## BIOLOGY—Group 1

**By John Ayres, Community High School, Normal, Illinois**

A Vitamin Project, Practical for High School Students
An Artificial Stomach—Explains Digestion
Observing Heredity with the Drosophila Fly
Examination of Bacteria in the Milk Supply
Analyzing the Water Supply for Bacteria

### Group 1A

Mold Cultured Cheese
Cheddar Cheese
Field Study of Birds
Mounting Birds
Embryos of Fish, Birds, and Mammals

## PHYSICS AND GENERAL SCIENCE

### Group 2

**By C. L. Beier, Community High School, Normal, Illinois**

Rotator—for Stroboscope effect, color discs, etc.
Stroboscope
Microprojector, for small groups
Simple type A. C. Motor
Powerful Electro Lifting Magnet

### Group 2A

D. C. Motor, Simple Type
Color Box
Three Way Switch
Huygen's Principle Tank
Crovis Disc for Sound

## CHEMISTRY PROJECTS

By the following authors—
M. E. WOODWORTH, Pittsfield High School, Pittsfield, Illinois
S. A. McEVOY, Rockford High School, Rockford, Illinois
WILLIS T. MAAS, Dupo High School, Dupo, Illinois
JOHN C. CHIDDIX, Community High School, Normal, Illinois

### Group 3

Testing Lubricating Oil
Hydrogenation of Vegetable Oils
Getting Sugar from Corn
Rayon—Synthetic Fibers
Photography

### Group 4

Making Paint
Making Plastic Wood
Making Bakelite
Making Lime
Making Polish—Wax type

### Group 5

Mirror Making
Electroplating
Obtaining and Using Casein from Milk
Making Ink
Tanning Leather

### Group 6

Crystal Growing
Making Models of Mineral Crystals
Clay Modeling
Etching Designs and Photographs on Metal
Fur Tanning

### Group 7

Making Baking Powder
Dyeing Cloth
Making Vanishing Cream
Making Cold Cream
Preservation of Food

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# SCIENCE PROGRAM

## HIGH SCHOOL CONFERENCE

### NOVEMBER 5th AND 6th URBANA, ILLINOIS

12:00—Chemistry Luncheon, Thursday Noon, November 5th.
University Place Christian Church, Corner Stoughton and Wright Streets. Make reservations early by writing to Glenn Tilbury, Urbana High School, Urbana, Ill.

## Physical Science Section

### Physics Building, Friday Afternoon, November 5, 1937

Chairman: H. R. Rahn, Mattoon High School, Mattoon, Illinois

2:00—The Old and the New in Photography—Herbert Johnson, Eastman Kodak Co., Rochester, N. Y.

3:00—The Scientific Method—Prof. Worth H. Rodebush, University of Illinois, Urbana.

3:30—Objectives of Physical Science in the High School—Nellie Bater, Champaign High School.

4:00—Types of Physical Science Courses in the High School—Russell S. Howard, Lyons High School, La Grange.

4:30—Guidance in Physical Science in the High School—Theodore R. Nelson, Decatur High School, Decatur.

## Physics Section

### Physics Building, Saturday Morning, November 6, 1937

Chairman: D. L. Barr, Morton Township High School, Cicero, Illinois

9:00—"The Physics of Photography"—Herbert Johnson, Eastman Kodak Co., Rochester, N. Y.

9:30—"A Demonstration Lightning Rod"—H. S. Lumsden, Physics instructor, Milford High School, Milford, Illinois.

9:40—"An Experimental Arrangement to Demonstrate Diffraction"—Robert C. Wyckoff, Science instructor, Toulon Twp. High School, Toulon, Illinois.

9:50—"Pile Driver Demonstration"—S. G. Cook, Department Physics, East St. Louis High School, E. St. Louis, Illinois.

10:00—"The Design of a Physics Unit in a Modern High School Building"—Ralph W. Lefler, Physics instructor, LaSalle-Peru-Oglesby High School, LaSalle, Illinois.

10:10—"A Visual Wheatstone Bridge Model"—Wm. A. Harriman, Head Science Department, Mt. Sterling, Illinois.

10:20—"Successful Physics Demonstrations and a Discussion of Formulas"—Byron D. Arrick, Mt. Carmel High School, Mt. Carmel, Illinois.

10:30—"Vitalized Physics"—A. M. Clem, J. Sterling Morton High School, Cicero, Illinois.

10:40—"Modern Trends in Curriculum Construction"—Prof. Charles Knudsen, George Peabody College, Nashville, Tennessee.

If time permits there will be a discussion of the curriculum committee report of the physical science section of Friday afternoon and the implications of Prof. Knudsen's talk.

---

## Chemistry Section

### (Illinois Chemistry Teachers' Association)

### Physics Building, Saturday Morning, November 6, 1937

Chairman: T. A. Nelson, Decatur High School, Decatur, Illinois

9:00-9:20—Open Discussion in Regard to the work being done by the Central Physical Science Committee as Indicated by the Papers Given in the Physical Science Section by Committee Members.

9:20-10:20—"X-Rays Forty-Two Years After"—Dr. G. L. Clark, University of Illinois.

10:20-11:20—"By-Products of the Meat Packing Industry"—Dr. H. E. Robinson, Nutrition Research Division, Swift & Co.

11:20-12:00—"Chemistry and the Control of Nostrums"—Dr. J. W. Neckers, Southern Illinois State Normal University.

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## BIOLOGY SECTION

**(Illinois Biology Teachers' Association)**

**Natural History Building, Friday Afternoon, November 5, 1937**

Chairman: Grace L. Cook, Urbana High School
President of Illinois Biology Teachers' Association

### FRIDAY AFTERNOON SESSION

2:00—Business and Announcements.

2:15—"Value and Use of Our Forest Resources" (Illustrated)—H. N. Wheeler, Chief Lecturer, U. S. Forest Service

3:00—Report of the Biology Curriculum Committee—M. C. Lichteneralter, Chairman, Lane Technical.

3:30—"Vacation in Alaska" (Illustrated)—C. F. Hottes, Head, Department of Botany, University of Illinois.

### SATURDAY MORNING SESSION

9:00—"Training The Biology Teacher"—Mary M. Steagal, Head of Zoology Department, Southern Illinois State Normal University, Carbondale.

9:30—"How to Acquaint Students with the Socal Fauna and Flora"—O. D. Frank, School of Education, University of Chicago.

10:30—Joint Session of the Administrative and Biology Sections—Conference on Social Hygiene Education.


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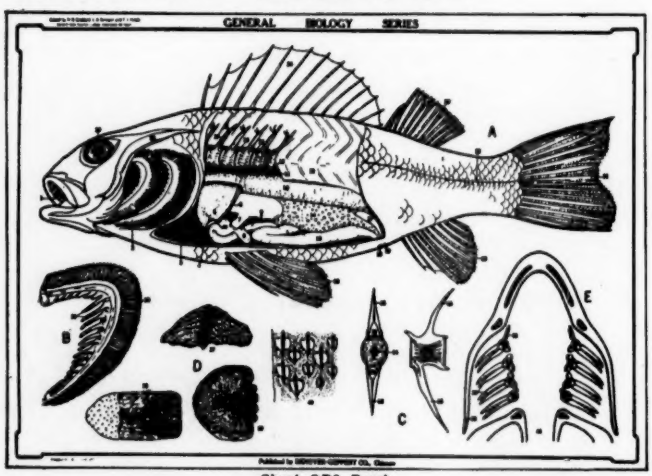

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# PROGRAM

## Second Illinois Conference on Social Hygiene Education

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MR. A. W. CLEVENGER, DIRECTOR

AND

**ILLINOIS STATE DEPARTMENT OF PUBLIC HEALTH**

DR. FRANK J. JIRKA, DIRECTOR

**10:30 A. M. Saturday, November 6, 1937, University of Illinois, Urbana**

The Administrative and Biology Sections of the High School Conference will adjourn and in a joint meeting continue with the following as the final part of their programs: Chairman, Mr. P. K. Houdek, Consultant on Social Hygiene Education, State Department of Public Health, and Biology teacher, Robinson Township High School

I Address—"Education for Social Living"—Dr. Ernest R. Groves, Professor of Sociology, University of North Carolina.

II Discussion.

Questions—

1. What preliminary plans by teachers have proven successful prior to initiating a program of sex education?
2. a. At what grade level should instruction in sex education be offered?
   b. In which subjects should some consideration be given to problems in this field?
3. What are the principal administrative provisions essential to a sex education program?
4. What characteristics are desirable in teachers involved in a sex education program?
5. Which grade or subject teachers should receive training in social hygiene?
6. What phases of social hygiene besides sex education should be included in our school programs?

Discussion Group—Miss Ethel Mae Krueger, Biology Instructor, Rock Island Senior High School; Dr. C. W. Sanford, Principal, University High School, Urbana; Mr. R. E. Stringer, Principal, Robinson Township High School; Dr. O. O. Stoops, Superintendent, Jacksonville Public Schools; Dr. R. W. Fairchild, President, Illinois State Normal University, Normal; Mrs. Margaret Wells Wood, Lecturer on Social Hygiene and Adult Education, State Department of Public Health.

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## SECOND ILLINOIS CONFERENCE ON SOCIAL HYGIENE EDUCATION

Mr. P. K. Houdek, biology teacher in the Robinson Township High School and former president of the Illinois Biology Teachers Association spent last summer as Consultant on Social Hygiene Education for the Division of Child Hygiene of the State Department of Public Health. On the twenty-fifth of June Mr. Houdek was chairman of the First Illinois Conference on Social Hygiene Education which was held at Springfield. This first conference was on the community aspect of social hygiene. At the time of the first conference and during the rest of the summer there was voiced, by school people all over the state, a request for another conference on Social Hygiene Education with special emphasis on school problems. This request is being answered by the conference indicated on the program above.

The principal speaker of the conference, Dr. Ernest R. Groves, is a nationally known authority on marriage and other phases of social hygiene education. He is the author of many books, pamphlets and magazine articles on the subject. He is an accomplished speaker and the Conference is fortunate in being able to secure him for the principal speaker. As noted on the program the conference is to be a part of the programs of the Administrative and Biology sections of the High School Conference. A considerable number of teachers of physical education, home economics, hygiene and health have indicated that they will be present at the meeting. Due to the limited time schedule a considerable amount of the suggestions, outlines and reference materials prepared by the members of the discussion group will be mimeographed and distributed before the start of the conference.

## ORGANIC CHEMISTRY IN THE HIGH SCHOOL

NICHOLAS D. CHERONIS
Wright Junior College Chicago, Illinois

(Continued from May issue)

The outline of the laboratory practice given here includes some exercises not commonly described in the manuals, which are drawn in a modified form from a laboratory manual for the college level by the author. Some may be used for individual or group laboratory practice and others for demonstration by the instructor.

**VI. Laboratory practice.**

1. Test to show that all organic compounds under appropriate conditions **burn** or oxidize to give carbon dioxide and water. During the process, deposition of carbon occurs. Wood, sugar, gelatin, naphthalene.
2. Demonstration by instructor that benzene, alcohol, etc., also burn. The vapor of glacial acetic acid also ignites.
3. Simple test for carbon and hydrogen in organic compounds. By heating with CuO, $CO_2$ and HOH are produced. The students may work together to perform tests with naphthalene and sugar, etc.
4. Comparison of physical and chemical properties of two compounds whose chemical composition is $C_4H_{10}O$. Use ethyl ether and butyl alcohol and note odor, rate of evaporation of a drop, and reaction of five drops with a bit of sodium metal.
5. Preparation of acetylene and distillation of coal.
6. Comparison of reaction of n-hexane, cyclohexane, cyclohexene and benzene with bromine water, 0.03% potassium permanganate, sulfuric acid, and a mixture of sulfuric acid and nitric acid. Use five drops of the hydrocarbon and one or two cc of the reagent. OMIT CYCLOHEXENE FROM THE LAST TWO TESTS. (Ten grams of each of these compounds are sufficient for a large number of tests and are not high in cost; they can be obtained from Wilkens-Anderson & Company, 111 Canal Street, Chicago, Illinois).
7. Preparation of a halide. In a test tube shake five cc of tertiary butyl alcohol with twelve cc of conc. hydrochloric acid for two minutes. Separate the halide formed (use a dropper). Add a pinch of sodium carbonate to remove the traces of acid and filter into a clean test tube.
8. Hydrolysis of the halide. Place ten drops of the halide in a test tube and add five drops of methyl orange (or methyl red; it is better to use a long range indicator) then add five cc of water. Note any change and explain.
9. Alcohols. Use ethyl alcohol, butyl alcohol and phenol to demonstrate the presence of the hydroxyl group. Reaction with sodium and phosphorus trichloride.
10. Oxidation of alcohols. Use 5 cc. 0.03% $KMnO_4$ and add five drops of methyl alcohol, ethyl alcohol and butyl alcohol, to show that they are easily oxidized. After ten minutes of warming, the odor of aldehyde is evident. Formation of ethyl ether—optional demonstration.
11. Reactivity of aldehyde. Usual tests with ammoniacal silver nitrate and Fehling's solution. Use formaldehyde and benzaldehyde.
12. Acids. Ten drops of acid (formic, acetic, butyric) in five cc of water to show presence of the hydrogen ion by indicator.
13. Formation of esters. Usual tests with acetic acid and ethyl alcohol, etc.
14. Hydrolysis:
    a. Hydrolysis of carbohydrates—detection of sugar by reducing tests.
    b. Hydrolysis of fats—preparation of soaps, evaporate liquor for glycerol. Prove by heating with $KHSO_4$, to obtain acrolein. (CARE); use also pure glycerol.
    c. Hydrolysis of proteins—show coagulation of proteins by heating. Hydrolyze gelatin by boiling with 30% sulfuric acid. (Demonstration). Show that urea contains ammonia.

The outline here presented attempts to give a brief survey of the compounds of carbon projected into a background with which the student is partially familiar and based upon the principles of the classification of carbon compounds into groups which show related properties and therefore are assumed to have similar structure. A simple relation, that of the oxidation of the carbon atom, connects the important groups. In the opinion of the author, such a study is both feasible and desirable for the high school level.

## FIRST AID

(Continued from page 10)

### II. Chemicals.

A. Irrigate extensively with water.

B. Use large quantities of very dilute acid or alkali as indicated. (Boric or acetic acid or sodium bicarbonate or ammonium hydroxide).

C. Then treat as any other burn.

### EYE

### I. Foreign Body

A. Do not attempt to remove an imbedded body.

B. Consult a doctor promptly.

### II. Chemical Burns

A. Immediate irrigation with large quantities of water.

B. A drop or two of olive or mineral oil.

C. Moist compress.

D. Secure medical aid.

### III. Neutralization

A. Unimportant.

B. Acid or alkali burn of skin increased by neutralizing agent.

C. Thorough irrigation immediately with a neutralizing fluid in preference to water is of questionable value and is not practical.

D. Neutralization after irrigation with water has no important effect.

E. Attempted neutralization with a weak solution without irrigation does not adequately neutralize the offending chemical, and it would be illogical to use a very strong neutralizing fluid.

F. In an eye which has been burned by an acid and has had treatment by immediate irrigation, one or two conditions exists:

1. either no free acid is present, or
2. the free acid is present in extreme dilution and is unimportant.

G. The base of the ulcer is covered by an insoluble acid proteinate and

1. weak alkali may dissolve this proteinate, and
2. react with the exposed cells to cause further damage.

H. Alkali burn

1. Proteinate is soluble.
2. Alkali tends to withdraw water from the cells.
3. Weak acid would tend to form insoluble proteinate, prevent further removal of water from exposed cells and do some good.
4. If all excess alkali has been removed by immediate irrigation, such treatment would be of little value.

I. The production of heat, salts, new inorganic acids, and alkalis when an attempt is made to neutralize may do harm in trying to do good.

J. Neutralization without removal is improper treatment. The most that can be said for a weak neutralizing substance after removal is that it may do little good after alkali burns and may do some harm after acid burns. (Hubbard)

K. Concentrated sulfuric acid does not burn much until water is applied. This acid should be wiped off first if possible and then large quantities of water used.

L. Alkali forms a layer of coagulated albumin above it. Water does not permeate this layer and hence does not neutralize nor dilute the alkali.

M. Ammonium chloride in a 1 or 2 per cent solution neutralizes alkali and does not produce heat in its chemical action because both are salts.

$$NaOH + NH_4Cl = NH_4OH + NaCl$$

N. The ammonium chloride solution also penetrates the coagulated albumin and neutralizes the caustic or alkali within the tissues. If stronger than 1 or 2 per cent, exfoliation of the corneal epithelium occurs.

O. According to Haseltine, 1 per cent ammonium chloride is a valuable aid in dealing with alkali burns.

---

### REFERENCES

1. Cosgrove, C. K. and Hubbard, W. B., **Acid and Alkali Burns of the Eyes, An Experimental Study.** Am. Surg. 87:89; January, 1928.

2. Hubbard, W. B., **Treatment of Acid Burns of the Eyes.** J. A. M. A. 107:446; 1936.

3. Haseltine, S. L., **Treatment of Acid Burns of the Eye.** J. A. M. A. 107:985; 1936.

## DRY ICE

(Continued from page 9)

filled with coke or iron turnings to cause the lye solution to come more intimately in contact with the ascending gases. These towers are about 10 feet in diameter and 100 feet tall. The solution contains about eight pounds of $Na_2CO_3$ per cubic foot of water.

$Na_2CO_3 + CO_2 + H_2O \rightarrow 2NaHCO_3$. The solution of $Na_2CO_3$ is called weak lye and the resulting $NaHCO_3$ solution is called strong lye. The absorption is little more than 50% efficient since some 8 or 9% of the original 17 to 20% escapes out the top of the second absorber along with the nitrogen which was present in the air used to burn the coke. More absorbers for higher efficiency have been found unsatisfactory.

The strong lye goes through the outside pipe of a heat interchanger and is heated by the hot, weak lye in the inside pipe. The lye boiler is heated by waste steam from the compressors, blowers, and pumps. The warm, strong lye is heated so the above reaction is reversed and $CO_2$ is driven off. $2NaHCO_3 \rightarrow Na_2CO_3 + CO_2 + H_2O$. Much steam from the lye boiler passes off with the $CO_2$ and this is condensed out in a water cooler and returned to the weak lye to keep its water content fairly constant. So far the process has made, purified and cooled, absorbed, and then driven off $CO_2$.

The $CO_2$ gas then goes to a triple tandem compressor, the pistons of which are all operated on a common shaft and therefore have the same size stroke, about 24 inches in length. The first cylinder is 18 inches in diameter, the second is 8½ and the third is 3½. Water coolers between cylinders remove part of the heat of compression. Between the second and third compressions there is provision for further cooling which is necessary to remove objectionable large amounts of water vapor. This water vapor would freeze and clog pipes and valves later in the expansion machine. Expanding gases are cooling gases, so $CO_2$ at about 1000 pounds pressure is introduced into the $CO_2$ in the expander cooler. After the third compression of 1000 pounds per square inch, the warm gas goes through a coil immersed in a tank of cooling water and the gas condenses to a liquid.

Most Dry Ice plants put part of the liquid $CO_2$ in steel cylinders for sale to bottlers of carbonated beverages or other users.

The liquid must be further reduced in temperature to efficiently produce Dry Ice and this is accomplished in the evaporator coolers. These are steel pipes about 12 inches in diameter and 21 feet long and are inclined as shown in the diagram. The black dots on the lower cylinder are spigots by means of which the operator determines when he has enough liquid for a "run" in making the Dry Ice. Part of the liquid evaporates in these tanks and is returned to the compressors. The remaining liquid thus gets colder. This liquid is let through a valve into the snow chamber, which is a cylinder with a piston at the top and also one at the bottom. About 50% of the liquid $CO_2$ is changed by this sudden expansion into snow. The pistons exert 3000 pounds hydraulic pressure and make a cake of ice 20 inches square and 10 inches deep.

This cake is quartered into 10-inch cubes by a band saw. These cubes are stored in cork insulated boxes which hold several tons and have the loading door on top. The Dry Ice may be shipped in special cars or may be placed in corrugated paper boxes. Due to the constant sublimation of Dry Ice, manufacturing plants have to be fairly close to consuming centers..

A 24 pound cake of Dry Ice was wrapped in a paper sack, then in a double sack containing ¼ inch of insulated material similar to mineral wool, then in a sealed corrugated paper box. In 19 hours the cake had lost 5 pounds 7 ounces. The temperature outside the box was about 20 degrees C. during this time. Another piece of Dry Ice similarly insulated had an initial weight of 25 pounds 14 ounces. Kept sealed, its weight constantly decreased until at the end of 115 hours all the Dry Ice was gone.

Dry ice now sells for 3 cents a pound at the factory. The price of the liquid is 14 1-2 cents a pound. Since the liquid is produced before the solid, it would at first appear that it should be cheaper. The heavy steel containers with valve connections are expensive and require care in cleaning and checking for safety.

### Uses of Dry Ice

Some of the uses mentioned are merely suggested possible applications, others are in actual use. Some use tons of Dry Ice daily and others only a few pounds. These uses are given as suggestions to the readers of this article; undoubtedly many others exist and the author will be glad to receive information regarding these.

1. About 80 per cent of all Dry Ice used is is consumed by the ice cream industry.
2. Shipment of frozen meats and fish.
3. Laboratory for production of cold temperatures.
4. Produce high vacua by condensation of vapors.
5. Dehydrates ether.
6. Dehydrate gases.
7. Chills out fats from alcoholic solutions of perfume concretes.
8. Freezes soil to roots of trees and thus aids in transplanting.
9. Freezes quicksand and thus aids in construction work.
10. Purifies oils of waxes.
11. Shrinks bushing for valve seats.
12. Soft aluminum rivets are stored in Dry Ice until ready for use. Ordinary temperature hardens aluminum rivets in half an hour.
13. Dry Ice put in a pipe and on changing to a gas exerts pressure and blows out obstructions.
14. Used by physicians as local anesthetic and in treating skin diseases.
15. Comfort cooling on hot automobile trips especially over deserts.
16. Chills sticky and gummy material for grinding.
17. Hardens silica steel after machining and does so without warpage or oxidation.

(Continued on page 22)


# SCIENCE

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## PHOTOGRAPHY

(Continued from page 7)

safe light is pointed out, since the sensitivity of the silver bromide is much greater than that of the chloride. Other types of enlarging cameras are discussed with the idea in mind that more expensive equipment is necessary only in that it is generally more convenient.

### 9. Etching and Retouching

Etching and retouching is the solution to a great many problems that arise during the enlarging process. Many worthless copies may be salvaged by the use of an inexpensive print retouching outfit. These blemishes are caused by careless processing or by allowing dust to settle on the negative or condensing lense. Of course this latter cause may be removed by using more care in the finishing, while the former is remedied by retouching. Retouching requires only two or three common graphite pencils, an etching pen and a small camel's hair brush. The use of these is demonstrated and then practiced. A good explanation of their use will be found in an article on page 98 of the April 1937 Popular Science.

### 10. Composition and Lighting

Composition and lighting are details that although generally neglected by the amateur are necessities for the creation of an artistic print. Many consider it out of reach of the layman to grasp these details, but they can be mastered with practice and training and it is none too soon to start acquiring this appreciation when the first picture is taken. In lieu of a discussion on this subject I offer you Fiedler's "Ten Commandments of Home Portraiture for the Beginner".

1. Avail yourself of the room that has the quietest lighting, the quietest wall decoration and the most comfortable furnishings.
2. Think out the picture well before hand.
3. Get the position of the subject from your camera best by testing different angles and distances.
4. Get a suitable background.
5. Balance the lighting.

6. Do not annoy the subject by lengthy manipulations, but determine the proper focus and expose quickly.
7. Be cheerful, but keep your whole attention on your task.
8. Watch your step when using artificial lighting.
9. For flash light pictures use photoflash bulbs as they are noiseless and smokeless.
10. Do not "stop down" too much for interiors and do not ask people to stand for a third exposure.

Modern photography discards the artistic in favor of emphasis of the material. This I believe is in many instances all right but does not give us the indisputable truth in the portrait, for we find that it must not only be a likeness of the subject but should simultaneously reproduce a physiological representation of the inner self. The above "Commandents" should help the amateur in accomplishing this.

This outline for photography as an extra curricular subject, as you no doubt realize, is by no means a complete and finished course on the subject, and no person after finishing such a course could be considered a photographer in the professional sense of the term. But it is sufficiently broad to give the student an insight into all its fields and to arouse an interest that may cause him to adopt it as a hobby. Changing society has convinced me that everyone in the future will need a hobby, and nowhere can we find one that would be more cultural and artistic than photography.

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## BACTERIA IN WARFARE

(Continued from page 8)

Enemy spies would find it difficult to infect soldiers in an opposing army because such soldiers are treated to make them resistant to it. Those in the civilian population behind the army are constantly protected even in times of peace. We must look elsewhere than to typhoid fever for a communicable disease with which to infect an enemy army. Most of us live all of the time in presence of the intestinal disease.

Examination of the bacteria which cause diseases of the respiratory tract, leads one to the same conclusion. Pneumonia and meningitis are not suitable diseases. The organisms which cause them are too delicate to live long in nature and they are present practically all of the time anyway in or on human beings which are in good health.

The venereal diseases are not suitable. Under most conditions it would be difficult to infect within a short time the soldiers in an army with syphilis or gonorrhoea. Too many difficulties are involved.

Communicable diseases caused by insects might at first thought be considered as possible for bacterial warfare. Consideration of some of the factors involved soon excludes them. Insects would not respect uniforms or other insignia and any susceptible human being would be prey to their bites. Such diseases would be malaria, typhus fever, yellow-fever and bubonic plague. None of these diseases could be used on account of the danger to all combatants. In America we are learning to live with plague, for instance, California has a highly infected rodent population. Spread of plague from these rodents to human beings is being controlled. This is another example of the ability of man to live with communicable disease.

It is difficult, therefore, to conclude that bacterial warfare would yield results commensurate with the difficulties and danger involved. Furthermore, trained personnel in the medical and sanitary corps of efficient armies, understand the epidemiology of disease which would afflict military forces.

## DRY ICE

(Continued from page 19)

18. Freeze body tissues for microscopic study even during an operation so a physician can readily distinguish between bad and good flesh.
19. Making neon and radio tubes.
20. Freezing a liquid to stop the flow so repairs can be made.
21. Liquefying a gas like chlorine in a tank so valve repairs can be made.
22. Testing gasoline engines and windshield wipers for low temperature operation.
23. A future possible war use is the freezing and transportation of bulk shipments of poisonous gases and then transfer to pressure tanks or shells close to the battle front.
24. Freezing of liquid centers for golf balls so the balls may be wound without distortion and so that the liquid as it warms will expand and make the ball harder and more elastic.
25. Chills crepe rubber for cutting to size for airplane sound proofing.
26. Spray $CO_2$ snow through the air to make rain and thus dispel clouds for fair weather events.
27. Freezing and concentration of smells for laboratory testing. Volatile, odorous materials may be condensed and then analyzed.
28. Cheap solid acid anhydride that can easily be shipped.
29. Fire extinguisher.
30. Carbonating ice cream.
31. Piece in insulated, porous container, placed in mouth, causes fog to form as exhalation occurs. This is used to mimic polar conditions in hot weather by movies

## ACTIVITIES OF ILLINOIS BIOLOGY CURRICULUM COMMITTEE

**By M. C. Lichtenwalter, Chairman**
**Lane Technical High School, Chicago**

The summer meeting of the Biology Curriculum Committee was successful. Considerable work was accomplished. Subcommittee papers were read and initial repor s given; the organization of the general committee was perfected; the personnel of the various subcommittees was discussed, and future plans of the study groups were outlined. The

(Continued on page 24)

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## ACTIVITIES OF ILLINOIS BIOLOGY CURRICULUM COMMITTEE

(Continued from page 22)

meeting was held during the Improvement of Instruction Conference at Urbana, July 13-16.

Three papers were read, each representing a report of a subcommittee. Mr. W. M. Bailey of Southern Illinois State Teachers' College of Carbondale submitted a preliminary report of the 'Training of Biology Teachers' subcommittee. Mr. Wesley W. Heinz of Mendota submitted a written report on 'Social Hygiene in the High School' and parts of another paper of a relative nature was read. Three other subcommittees submitted initial reports of their activities. These were Mrs. Cook of Champaign, chairman of 'Guidance of a Biological Nature,' Mr. Houdek of Robinson, chairman of 'Subject Areas,' and Mr. Astell of Urbana, chairman of 'Specific Suggestions for Improvement of Biological Instruction'.

The organization of the general committee is practically complete, at least for the present. Each committee member has been assigned chairman of one of the seven subcommittees (May 1937, page 13 'The Science Teacher'); the secretary is to serve as editor of materials submitted by the subcommittees for review, criticism, or publication; and the general chairman is to aid in coordinating the work of the subcommittees.

The subcommittees are organized and functioning. Most of them have held at least one meeting at which they have prepared a topical outline and plan of procedure for their work. The chairmen of each of the subcommittees have selected other instructors to work with them on their committees. The chairmen have chosen these people from the various High Schools and Normals of the state, the University, and the State High School Visitor's Office. More will be added from time to time as the subcommittees get under way.

The purpose of the Curriculum Committee together with its various other subcommittees is eventually to prepare and place at the disposal of the teachers of the state useful information of a biological nature, material which will be useful in their class rooms.

The general committee plans to hold its next regular meeting during the fall session of the Illinois Biology Teacher's Association. Any teacher or group of teachers interested in the work of the committee are invited to attend the meetings, take part in the discussions, and make any contributions they desire.

## FIRST CHEMISTRY COURSE

(Continued from page 3)

justified in their complaints that we sometimes spend too much effort and time in teaching such things as the methods of preparing oxygen, hydrogen, and other substances in the laboratory and too little time on the composition, uses, and applications of substances. It is more important to the average individual, for example, to know how the human body obtains and uses its oxygen supply than it is to know how oxygen can be prepared from potassium chlorate. There seems to be a growing opinion that emphasis might be reassigned and new material included. Although he agrees with this opinion on the whole, the writer hopes that when these revisions are made, there will still be room in our texts and in our teaching for enough of the material concerning fundamental principles that the students of the future will know enough chemistry really to understand the applications of the subject.

## THE READER'S LOOKOUT

The Glass Industry Goes Modern, Robert G. Skerrett, Science Digest, October, 1937, pp. 9-12.

Textiles Go Chemical, Joseph F. Harold, Science Digest, September, 1937, pp. 81 4.

The Family Tree of Vitamin D, Robert S. Harris, Massachusetts Institute of Technology, Science Digest, August, 1937, pp. 41-4.

The Young Chemist and the Government Service, Louis Marshall, Junior Chemist, U. S. Civil Service, Journal of Chemical Education, October, 1937, pp. 476-9.

Next Ten Years in Science Education, Science Education, April, 1937.

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# BIOLOGY

by

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* * *

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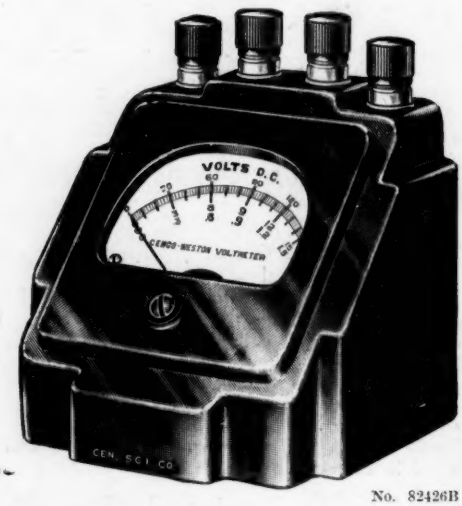


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